Abstract #103

Interpretation of Water-Quality Data Using Ion-Pair Relationships

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Biographical Sketches of Authors

Tim Kresse is the Ground-Water Protection Program manager in the Water Division of the Arkansas Dept. of Environmental Quality. Mr. Kresse received his B.S. and M.S. in geology at the University of Arkansas in Fayetteville, is a professional geologist, and has worked in the water-quality field within both the private consulting and state government arenas for more than 18 years. He has authored or co-authored more than 30 professional papers and has presented numerous papers at professional seminars. His area of interest resides primarily in geochemistry and water-quality interpretation.

John Fazio is a Geologist in the Planning Branch of the Water Division of the Arkansas Department of Environmental Quality. Mr. Fazio worked for 6 years in the Underground Storage Tank Program at ADEQ, and for the past four years has been managing the Ambient Ground-Water Monitoring Program in the Water Division. He has co-authored several professional papers and has been involved in several 319 Nonpoint Source investigations. His areas of interest include geohydrology and water-quality interpretation. Mr. Fazio received his B.S. Degree in Geology from the University of Arkansas, and his post-graduate studies focused on sedimentology.

Abstract

In past years, water-quality data collected by both federal and state agencies focused on ground-water quality in reference to drinking water standards, with little attention toward identifying geochemical data trends. These early reports often included some basic descriptive statistics, Piper diagrams, and identification of general water type. The use of graphical analysis of ion-pair relationships can enrich water-quality reports by providing underlying links to geochemical processes influencing geochemical evolution and redox conditions of ground water along identified and/or inferred flow paths.

Ion-pair relationships can be used in quality control of analyses, which generally requires conductance, TDS, and the major ions contributing to TDS. Ion-pair relationships, together with simple statistical analyses, also have been used to obtain strong corollary evidence for the geochemical evolution of ground water, in addition to identifying sources of elevated (>10 µg/L) arsenic, in the alluvial aquifer in eastern Arkansas. The data can be expressed in various units (i.e., mg/L, meq/L, etc.) depending on the relationships under investigation. The use of data in equivalent concentrations often provides far more beneficial results over the use of concentrations by weight, especially for use in assessing the stoichiometry involved in mineral dissolution and precipitation, cation exchange, and other processes affecting the geochemical evolution of ground water. The identification of chemical sources and sinks affecting ground-water geochemistry provides a framework for future geochemical modeling or prioritizing locations for site-specific investigations.